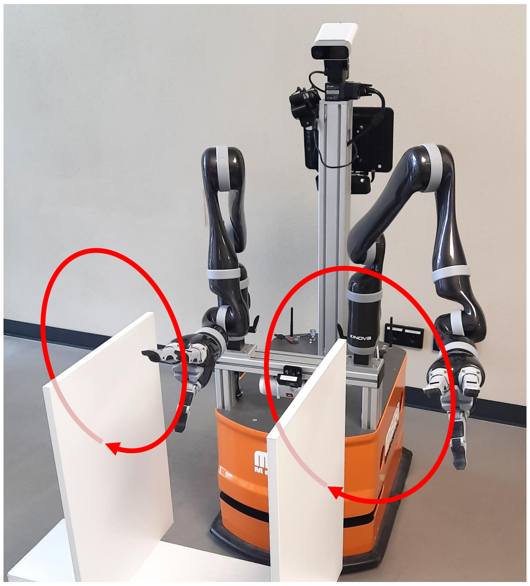

Fig. 3: Real world setup with two armed Scitos X3, paths of the goal positions and obstacles.

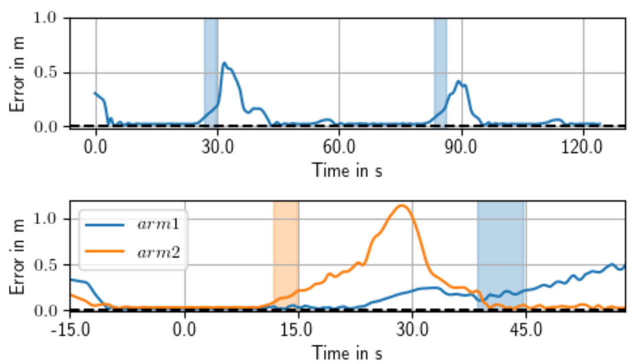

Fig. 4: Resulting distance between end effector and goal over time. Interval at which a goal position was unreachable is marked. Top shows results of single arm experiment and bottom with two arms.

optimized in position yet, forcing the second arm on a sub optimal path.

VII. CONCLUSIONS

In this paper a motion planner is proposed, working with a dynamic and local update of a probabilistic roadmap in closed loop operation. We showed the effectiveness of the mechanism for managing the connectivity in the graph in order to handle heterogeneous density of nodes and keep the number of edges low. Further, we could demonstrate, that a grasp task can be solved more effective, if the set of possible grasp poses is also considered by an implicit formulation of the goal in form of a reward for a MDP, rather than just moving to the best rated single grasp goal position on a shortest path. Additionally, we showed, that a decomposition of the reward function together with the constraints given in our motion planning scenario allow to find an exact solution for the MDP in $O(nlog(n))$, which is done in each planning cycle.

In future work grasping for real objects presented by a human will be evaluated in more detail. Unfortunately, the robust and stable tracking of handheld objects,which is a prerequisite for the motion planning, is a hard task on its own and has to be solved first.

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